# Jianghan Zhang

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## Education

**New York University**, New York, NY. Jan 2022 – May 2025

- B.S. in Mechanical Engineering, minor in Robotics and Mathematics
- GPA: **3.934/4.0**

(Transferred from Beijing University of Posts and Telecommunications in January 2022)

## Research Experience

**Undergraduate Research Assistant, Machines in Motion Lab, NYU** Jun 2023 – Present

Advised by Prof. Ludovic Righetti

**Research Project: Accelerated gradient descent algorithm for MPC** Jun 2023 - Apr 2024

**Keywords: Non-linear MPC, Accelerated Gradient Descent, C++, Real-robot deployment**

- Designed and developed an accelerated gradient descent algorithm for real-time, high-frequency Nonlinear Model Predictive Control, achieving performance comparable to Differential Dynamic Programming at 1 kHz (LBR paper accepted by the 21st International Conference on Ubiquitous Robots)
- Enhanced solver efficiency by systematically investigating various first-order optimization algorithms for non-linear MPC problems, resulting in an algorithm 4x faster than a SOTA DDP solver per iteration.
- Reduced computation time to **less than 1ms** per control cycle for a 7-DoF manipulator by implementing advanced acceleration techniques (e.g. parallelization) in C++, enabling high frequency deployment.
- Presented a poster of this work at the 21st International Conference on Ubiquitous Robots.

**Research Project: Contact Implicit Trajectory Optimization** Jun 2024 - present

**Keywords: Trajectory Optimization, MuJoCo, Contact Model, Dexterous Manipulation, Legged Locomotion**

- Developing contact implicit trajectory optimization algorithms to enhance robotic interaction with environments, enabling dexterous manipulation and legged locomotion without pre-specified contact sequences.
- Integrated the MuJoCo contact model into trajectory optimization, effectively generating **a range of motion trajectories for a quadruped robot**.
- Exploring alternative contact models, including learned models, to enhance the performance and versatility of the algorithm for dexterous manipulation tasks.

**Undergraduate Research Assistant, AI4CE Lab, NYU** Jun 2023 – Sep 2023

Advised by Prof. Chen Feng

**Research Project: Predicting 3D Action Target from 2D Egocentric Vision for HRI**

**Keywords: Machine learning, HRI, Real-world Scenarios, Obstacle Avoidance, Human action prediction**

- Collaborated with a team of researchers to improve safety and efficiency in Human-Robot Interaction (HRI) by developing a 3D human action target prediction algorithm from 2D egocentric vision using machine learning, and implemented real-world HRI demonstrations on a UR10E cobot (paper accepted by **ICRA 2024**)
- Led the development of real-world demonstration for practical validation of the proposed algorithm.
- Proposed HRI demonstrations that showcased **real-world scenarios** where a human and a robot shared a common workspace
- Developed **obstacle avoidance** controllers to avoid the predicted human action targets.
- Integrated the algorithm with obstacle avoidance controllers and deployed the combined system on a UR10e for real-world HRI demonstrations.

## Publications

**EgoPAT3Dv2: Predicting 3d action target from 2d egocentric vision for human-robot interaction**
Irving Fang[*], Yuzhong Chen[*], Yifan Wang[*], ***Jianghan Zhang***[†], Qiushi Zhang[†], Jiali Xu[†], Xibo He, Weibo Gao, Hao Su, Yiming Li, Chen Feng (*,† for equal contribution)
*In 2024 IEEE International Conference on Robotics and Automation (ICRA) 2024*

**Accelerated gradient descent for high frequency Model Predictive Control**
***Jianghan Zhang***, Armand Jordana, Ludovic Righetti
*In 2024 21st International Conference on Ubiquitous Robots (UR) 2024 (As a late breaking results paper)*

## Work Experience

**Java SWE, Beijing Qingzi Future Network Technology Co.**, Beijing, China Jul 2019 - Sep 2019

- Implemented robust database systems and table structures for the ToTok Game Center platform, utilizing Spring Boot, JavaScript, and Linux.
- Applied architectural methodologies to support the design and optimization of backend functionalities, contributing to scalable and efficient data management.
- Collaborated with cross-functional teams to ensure database implementation strategies aligned with overall project objectives, enhancing system performance and user experience.

## Technical Skills

**Programming Languages:** C++/C, Java, Python, SQL, MATLAB, TEX

**Frameworks/Libraries:** ROS, Crocoddyl, Pinocchio, PyTorch, MuJoCo, Pybullet, Boost.Python, Numpy

**Mechanical Engineering:** SolidWorks, Fusion 360, Ansys (FEA), 3D Printing

## Completed online courses

**Coursera:** (1) Machine Learning (2) Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning (3) Neural Networks and Deep Learning; (3) Improving Deep Neural Networks: Hyperparameter Tuning, Regularization, and Optimization (5) Convolutional Neural Networks (6) Sequence Models